

***MMT-***

115/230DR10AL-01

115/230DR10AL-02

## DC Driver Operation Manual



Jinan Keya Electron Science and Technology Co., Ltd.

**Please read this operation manual thoroughly before using this device.**

Any failures and damages caused by non-compliance of precautions stipulated in this operation and installation manual are beyond the scope of warranty and the manufacturer disclaims any responsibility for them. This manual must be carefully kept. In case of any question, please contact us!



**This picture represents an important notice or warning**



### **Safety precautions**

- Installation, connection and commissioning of this device shall be carried out by professionals.
- Do not install, remove or replace device circuit under charged circumstances.
- Please make sure that necessary protectors are mounted between power input end of this device and power supply to avoid accidents or fatal damages; Devices need to be mounted: over-current protector, fuse, emergency switch.
- Isolation and insulation protection between device and ground as well as devices shall be well equipped.
- In case that charged commissioning of this device is really needed, well-insulated nonmetal special screwdriver or special commissioning tools shall be used.
- This device shall be installed in well-ventilated environment.
- This device shall not be directly exposed to abnormal environments with high humidity, dust, corrosive gas and intense vibration.



### **ATTENTION!**

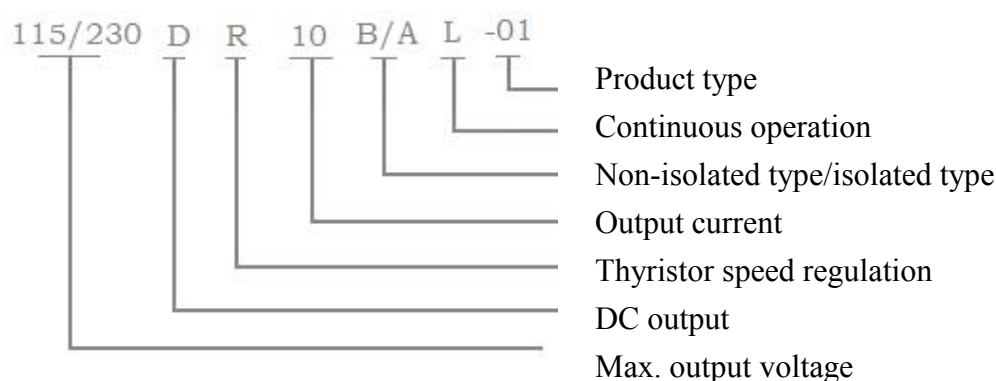
Control mode of driver is divided into non-isolated type (BL products) and isolated type (AL products). As all outlet leads belonging to non-isolated type are charged with high voltage, be sure to take isolation and safety measures during installation and operation to avoid electric shocks. Please read this manual carefully before using this device.

MMT-115/230DR Series DC motor driver is a kind of speed governing product developed and produced by adopting past successful experience and combining modern advanced technology. This series of products have met international standard requirements and are sold to many countries. This driver adopts thyristor chopping control principle and uses independent trigger mode. Even there is no velocity feedback, high speed ratio can be achieved to make it more accurate and reliable.

Excellent performance, reliable quality and high cost performance make it a strong performer in DC motor driver field and it was widely used in plastic machinery, food machinery, cable equipment, machining, paper printing, testing equipment, laboratory equipment and mixing equipment, etc.

## I. Specification and model

Model	Max. output current DC: (A)	Max. output voltage DC: (V)	Input voltage range AC: (V)
115/230DR10AL-02	10	115/230	115/230



## II. Product characteristics

- SMT technology, small size
- Good following features, rapid respond speed
- Wide speed ratio, strong mechanical features
- Applicable to permanent magnet , DC torque motor
- Double closed-loop PI regulation (Voltage, current)
- Current setting and current-limiting protection (continuous operation setting current)
- Large low speed output moment
- Over-current protection function
- Quick stop function
- Arbitrary setting of upper and lower speed
- Soft start, soft stop setting function
- Selection of speed mode, torque mode
- Normally open, close selection of enable signal
- Selection of input, output voltage switch

■Driver speed governing controlled by standard signal input 0-5V or 10K potentiometer

### III. Technical parameters

□input voltage AC: 115V/230V $\pm$ 10% (other voltages can be customized as customer's requirements)

□frequency: 50/60HZ $\pm$ 5%

□output voltage DC: 0~90V    0-110V    0-160V    0-180V    0-220V (can be set)

□rated output current: 10A

□revolving speed ratio: 80:1

□output voltage accuracy:  $\leq$ 0.1%

□soft starting time: 0.2S-20S

□soft stopping time: 0.2S-10S

□environment temperature: -10 $^{\circ}$ C $\sim$ +60 $^{\circ}$ C

□environment humidity: relative humidity  $\leq$ 65% (no moisture condensation)

□insulation voltage resistance: 1500V AC

□insulation resistance:  $>$ 500M $\Omega$

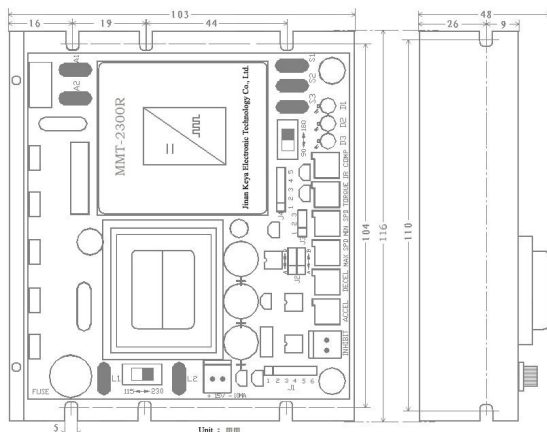
□leak current:  $\leq$ 0.09mA

### IV. Product performance

1. Strong mechanical features, static rate is 1%.
2. Wide speed governing range (0-MAX SPD setting value)
3. Rapid dynamic response process
4. Automatic smooth transition process during speed up and cut.
5. Good excavation features which automatically limit over-current within the range of set value.
6. High reliability, compact structure, extremely high cost performance

### V. Installation instructions

**L\*W\*H=116mm\*103mm\*48mm**



## VI. Installation requirements



### WARNING

1. Do not install, wire or remove the controller under charged circumstance. Otherwise, accidents or serious damages may be caused. Before installation, you must read thoroughly and understand “safety precautions” (Page 2) and strictly abide by stipulated requirements.
2. Drive elements is very sensitive to electromagnet static field interface and shall be kept away from environments where static is easy to be generated; otherwise, speed controller may be damaged.
3. The driver shall be kept away from dust, high humidity environment and prevented from accidental contact. Sufficient space shall be reserved around the driver for easy ventilation and regulation.
4. When fixed, the driver shall be kept from other heat sources. Guarantee that the driver works in the specified environment temperature range.
5. The driver shall not be installed on equipments with extreme vibration; if not, precaution against vibration shall be taken.
6. The driver shall be installed in horizontal or vertical direction.

## VII. Wiring requirements

1. Do not connect wire under charged circumstance.
2. Insulated connection, shielded wire which match with driver’s voltage current shall be selected and connected, specifications of driver’s power input wire and motor’s wire are shown below:

### Wire Specification and Length Table

Current (A)	Wire specification (mm <sup>3</sup> )	Max. length (m)
5	1	15
10	1.5	15

3. Signal line and control line shall adopt shielded wire and shall be separated with power input wire and output wire.

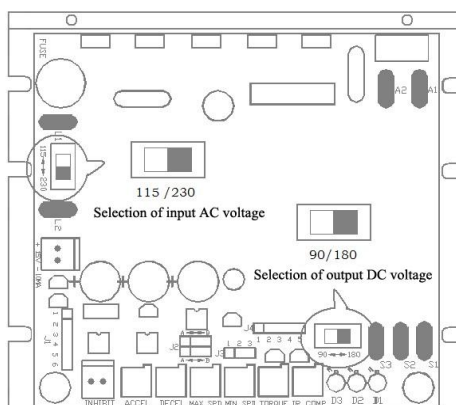


### WARNING

In any cases, signal line and logic control line shall not be bound, mixed and wired with power input wire, output wire (motor line) and other power lines. Induced voltage generated may cause interface, malfunction or directly damage the driver.

4. The driver do not have internal power supply and output reverse connection protection function, make sure that wiring between power input and driver is correct, otherwise the driver may be damaged.
5. Proper tools shall be used for wiring and make sure that wiring is correct.

## VIII. Description of input, output dial switch

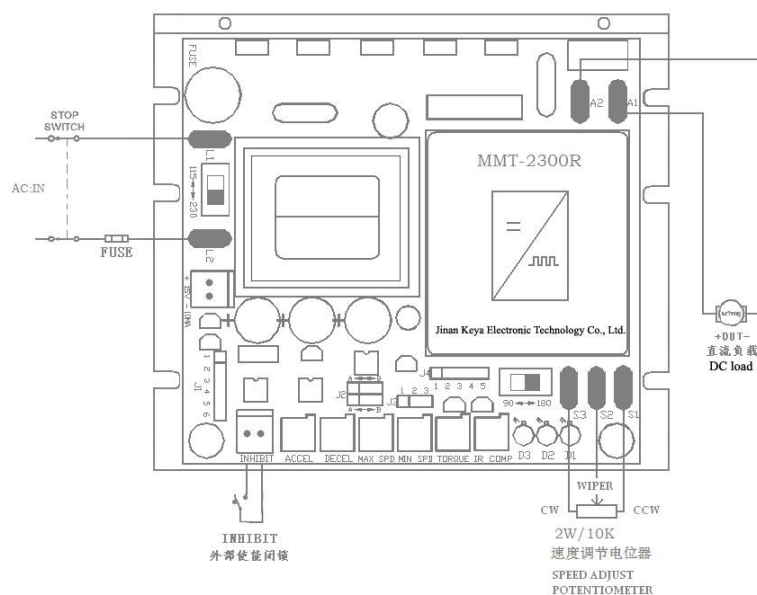


**1. Description of AC input voltage:** input voltage AC 115V-AC 230V.

**2. Selection of DC output voltage:** MAX SPD sets maximum output voltage, in case that dial switch is located at 180 gear, output voltage is the setting value of MAX SPD, in case that dial switch is located at 90 gear, output voltage is 1/2 of setting value of MAX SPD, (for example: MAX SPD modulation output voltage is 220V, when dial switch is located at 180 gear, maximum output voltage is: 220 V, when dial switch is located at 90 gear, maximum output voltage is: 110V).

## IX. Wiring schematic diagram

(Take non-isolated external potentiometer signal control as an example, wiring description and its detailed introduction are shown as follows)



## X. Selection of control signal input mode



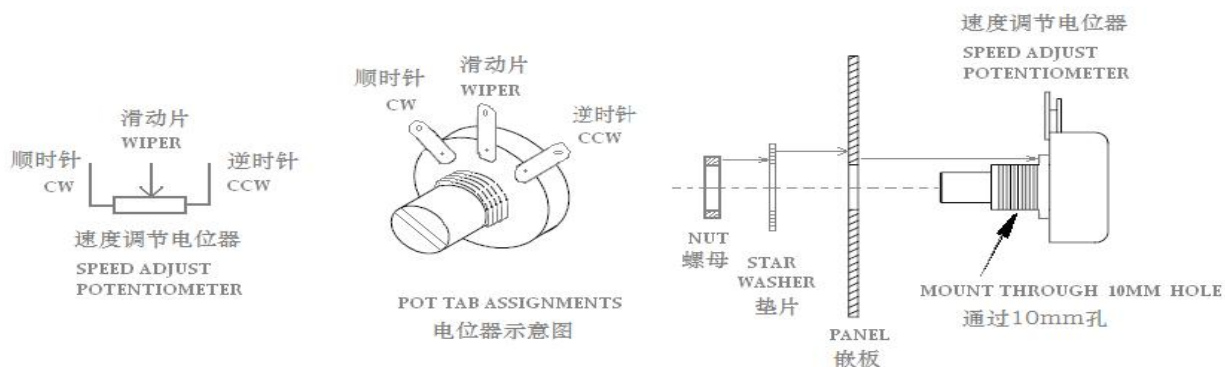
### ATTENTION!

Control mode of the driver shall be divided into non-isolated type (BL product) and isolated type (AL product). As all outlet leads belonging to non-isolated type are charged with high voltage, be sure to take isolation and safety measures during installation and operation to avoid electric shocks. Please read this manual carefully before using this device.

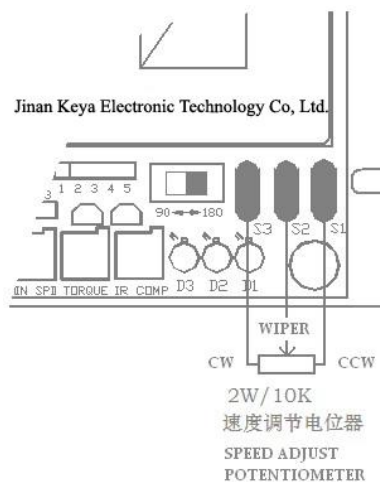
### 1. Non-isolated type (only refers to BL product)

**a. External potentiometer connection type:** a 2W/10K potentiometer control driver shall be used for speed governing and wired in accordance with following picture.

Installation method:



Connection description of potentiometer (BL product):

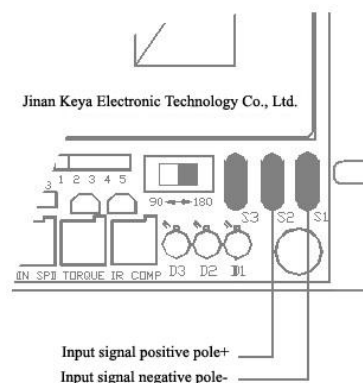


#### WARNING

1. S3 terminal of the driver provides 5V output voltage, 5mA current (relatively small), so other external loads cannot be connected (such as digital display instrument, indicator), otherwise, driver may be damaged.
2. In order to reduce unnecessary electronic signal interface, wiring length of speed governing potentiometer shall be shortened as much as possible. If the wire exceeds 0.5m, shielded wire shall be used and shielded net shall be single-ended grounded.

#### 2. Isolated type: (only refers to AL product)

For AL isolated product, 0-5V, 0-10V external standard signal control connection types are shown as follows. Only a kind of control signal can be adopted for each control application. **Specify control mode while placing an order.**



AL product external signal input description



#### WARNING

1. Shielded wire must be used for standard signal input and shielded net shall be single-ended grounded.
2. For above-mentioned control mode, only a kind of method can be adopted; several types of simultaneous connections are prohibited.
3. Shielded wire must be used for all control signals and shielded net shall be single-ended grounded.

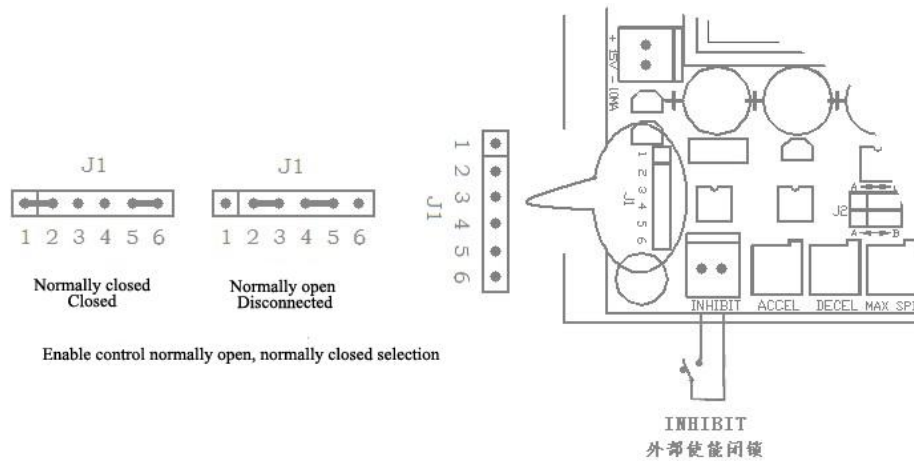
### XI. Enable control terminal

**INHIBIT** Factory settings: normally open

Enable control: Controller output can be stopped and started via a “enable cable”.

Control mode can be divided into: normally open, normally closed. Select control mode by skipping switch on J1.

As shown in the figure: a transistor can also be used to replace the switch.



Note: wiring of enable control shall be shielded wire.

### 1. Normally open:

When two ends of “enable control terminals” are disconnected, its internal circuit will rapidly accelerate the motor speed until reaches MAX SPD setting value.

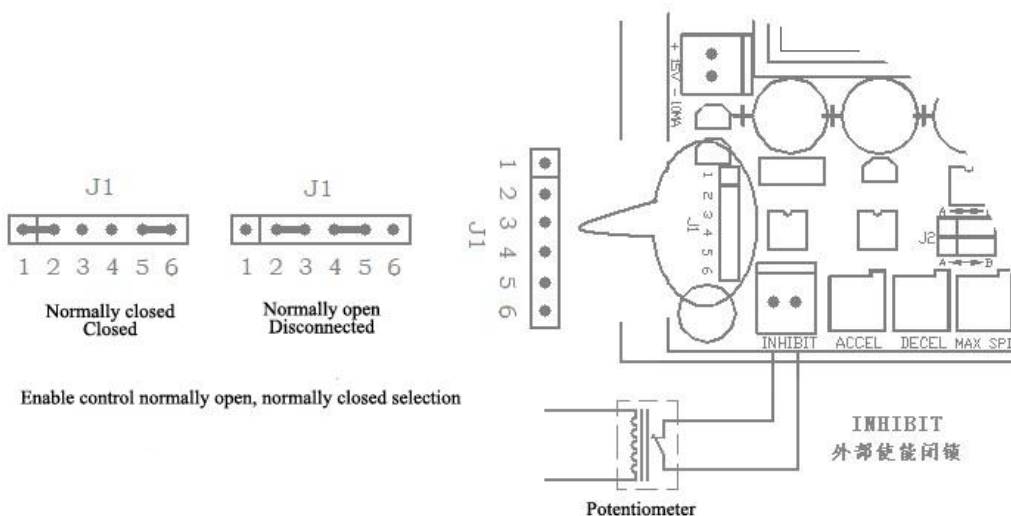
When two ends of “enable control terminals” are closed, its internal circuit will rapidly decelerate the motor speed until reaches MIN SPD setting value (note: See J3 contact pin settings), in case that setting value of MIN SPD is 0, motor will be stopped.

### 2. Normally closed:

When two ends of “enable control terminals” are closed, its internal circuit will rapidly accelerate the motor speed until reaches MAX SPD setting value.

When two ends of “enable control terminals” are disconnected, its internal circuit will rapidly decelerate the motor speed until reaches MIN SPD setting value (Note: see J3 contact pin settings), in case that setting value of MIN SPD is 0, motor will be stopped.

3. For long control distance, conversion transmission (nearby connection) mode shall be adopted, wiring of enable control shall be shielded wire and shielded net shall be single-ended grounded. As shown in the figure:



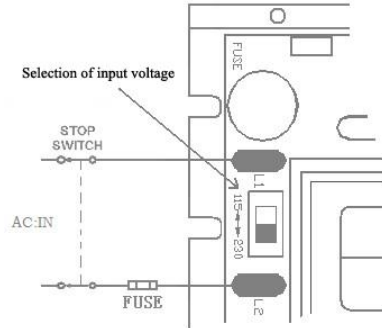




Note: when the motor is started, stopped frequently, terminal control shall be used. Otherwise, equipment may be damaged.

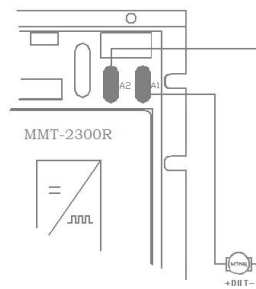
## XII. Description of AC input power

1. A quick-fused fuse and power main emergency switch shall be mounted between power input end and power supply to protect the driver from necessary emergency power off. See figure below



2. Selection of quick-fused fuse and battery main switch: rated current value of battery main switch shall be greater than or equal to 150-200% of motor rated current).
3. During the delivery of current, be sure to confirm the position of dial switch to avoid unnecessary troubles.

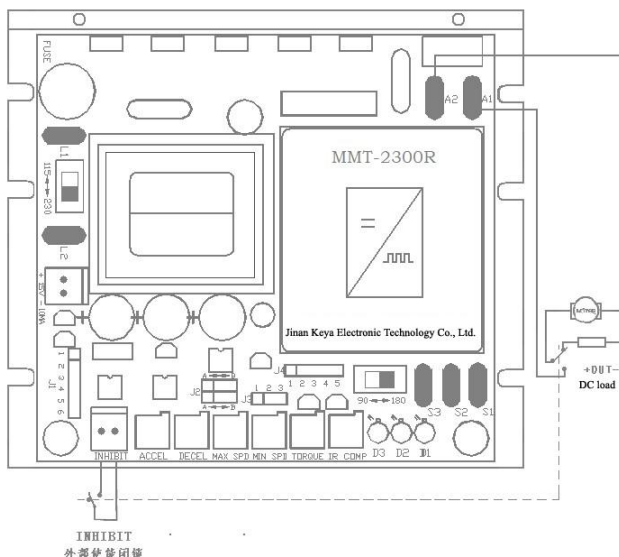
## XIII. Description of DC motor wiring



**DC load**

1. The driver powers the motor through “+OUT-”. Supposing that OUT+ connects to the positive pole and OUT- connects to negative pole, the motor is in clockwise rotation, if counterclockwise rotation is required, reverse the connection of OUT+, OUT-.
2. Please confirm that rated voltage value of motor matches with output voltage of the driver.

## XIV. Connection type of prompt braking (dynamic braking)



Such control mode can achieve good breaking effect.

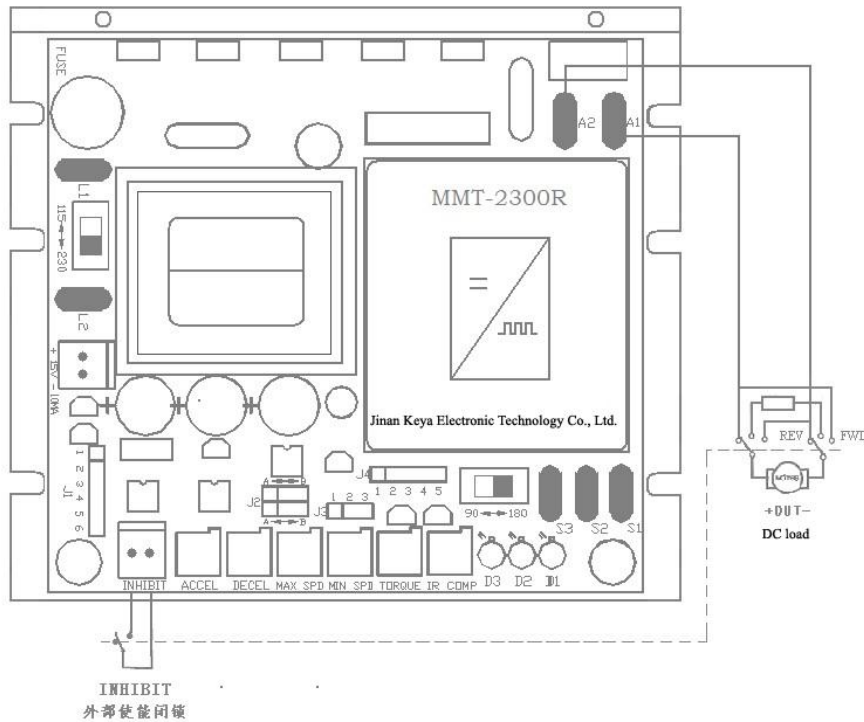
Selection of break resistance:  $P$  (power of break resistance) = actual power of motor  $\times 0.8$

$P$  (value of break resistance) = rated voltage  $\div$  (rated current  $\times 1.2$ )



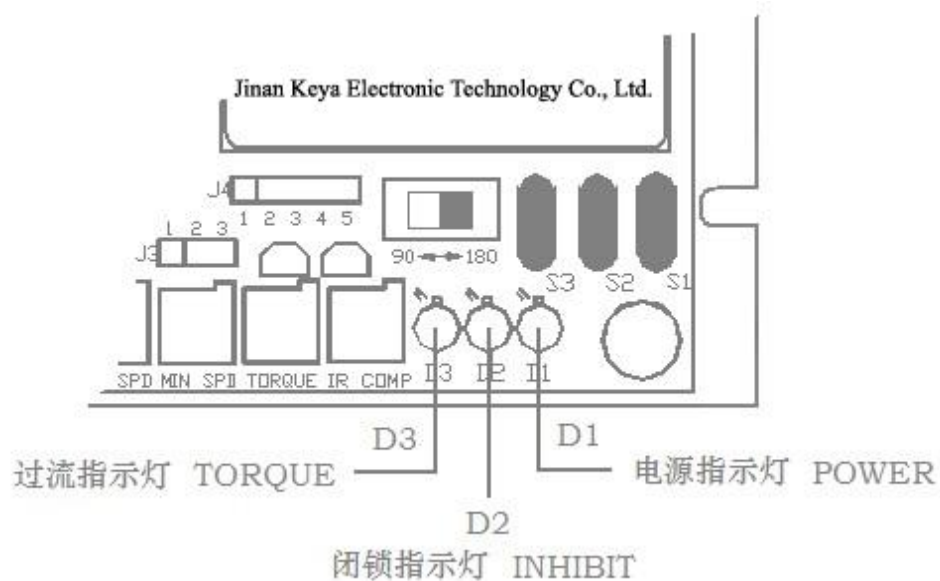
**Note:** When such mode is used for breaking (dynamic breaking), be sure to be used with enable terminal cooperatively, otherwise, drivers may be damaged.

## XV. Reverse control mode of forward/reverse rotation



**Note:** when such mode is used for breaking (dynamic breaking), be sure to be used with enable terminal cooperatively, otherwise, drivers may be damaged.

## XVI. Indicator description

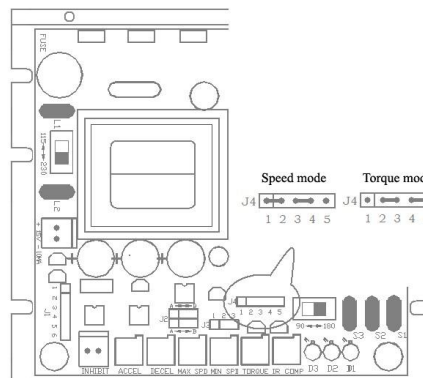


Descriptions of specific indicator status are shown as follows:

Indicator	Bright status	Dark status
POWER (Green)	Various internal working power supply is normal and stand ready	No working power supply is connected or the driver is abnormal
INHIBIT (Yellow)	When normally open is effective, enable terminal closed controller does not work When normally close is effective, enable terminal disconnected controller does not work	When normally open is effective, enable terminal is disconnected and controller does not work When normally close is effective, enable terminal is closed and controller does not work
TORQUE (Red)	Output current reaches TORQUE setting value or is overload	Within the allowable range of current setting value

## XVII. Selection of speed mode, torque mode

### Factory setting: speed mode



#### 1. Speed mode:

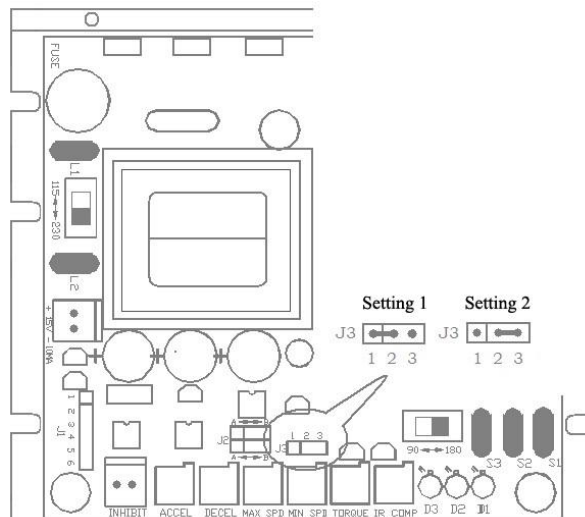
Under speed mode, external potentiometer (2W/10K) regulates the motor speed; potentiometer “TORQUE” on circuit board can set the maximum torque of motor. Shorted connection of No.1 and No.2, No.3 and No.4 “J4” contact pin will be selected.

#### 2. Torque mode:

Under torque mode, external potentiometer (2W/10K) regulates motor torque; potentiometer “TORQUE” on circuit board can limit the maximum torque of motor and potentiometer “TORQUE” can set maximum revolving speed. Shorted connection of No.2 and No.3, No.4 and No.5 “J4” contact pin will be selected.

## XVIII. Selection description of J3 contact pin

### Factory settings: setting 2



### 1. Setting 1:

Under setting 1 mode, when enable terminal is invalid, its internal circuit will rapidly decelerate motor revolving speed until reaches MIN SPD setting value, in case that MIN SPD setting value is 0, the motor will be stopped.

### 2. Setting 2:

Under setting 2 mode, when enable terminal is invalid, its internal circuit will rapidly decelerate motor revolving speed, the motor will be stopped.

## XIX. Selection of over-current protection mode

Factory setting is: over-current stop mode “B”

1. The driver can select over-current protection mode by red short circuit block: A. over-current amplitude limiting protection mode, B. over-current stop protection mode.

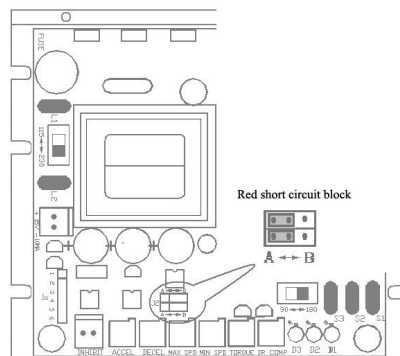


### WARNING

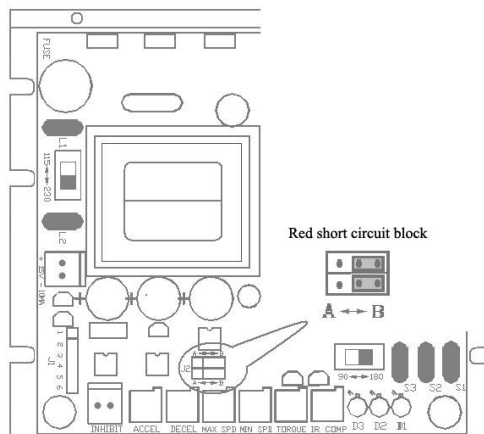
During the selection of protection mode, driver shall be discharged and two red short circuit caps skip at the same time, otherwise, driver may be damaged.

1. Double-row shorting pin has two positions of “A-B”, specific options are as follows:

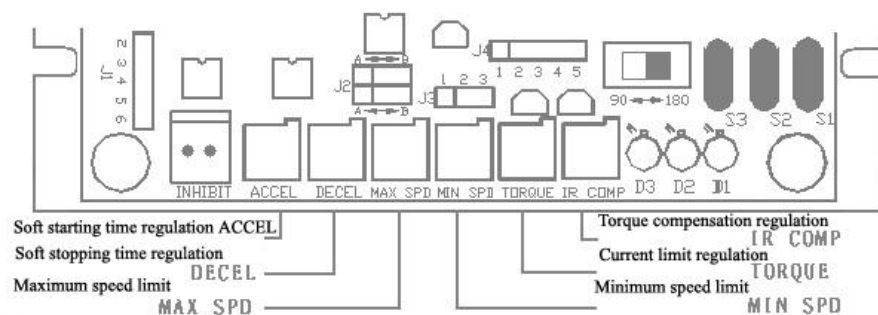
a. When red short circuit block is at “A”, over-current amplitude limiting protection mode is selected: see figure below  
When such protection mode is selected and output current of the driver reaches the setting value of current regulation potentiometer (TORQUE), then the driver turn into automatic operation to guarantee that output current value is constant to be the setting value of current regulation potentiometer (TORQUE), this is called over-current amplitude limiting protection state to protect motor from over-current.



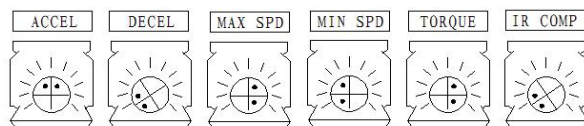
b. When red short circuit block is at “B”, over-current stop protection mode is selected: see figure below  
When output current of the driver reaches the setting value of current regulation potentiometer (TORQUE), then the driver automatically stops output and enters into over-current stop protection status to protect motor from over-current. Such status is a factory default setting status.



## XX. Potentiometer regulation description



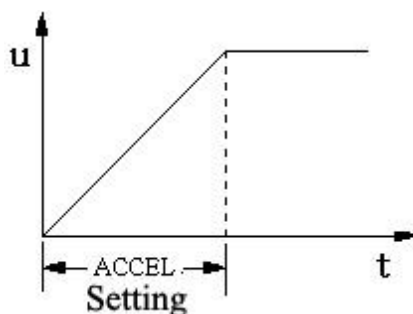
Factory settings are shown as follows:



**Note: adjustable angle of all potentiometer is 273°.**

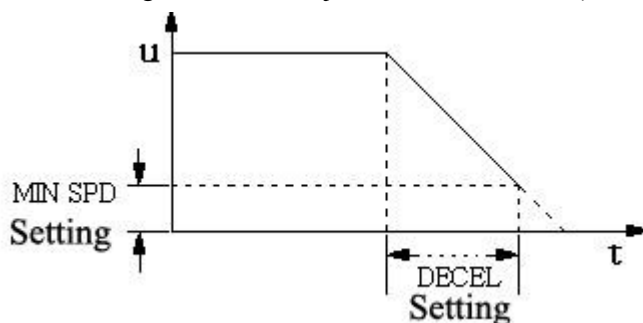
1. Soft starting time regulation: ACCEL

Regulate the ACCEL of such potentiometer can confirm that clockwise time of rising slope rises from initial speed to setting speed (i.e. rise time, setting time can be adjustable within 0.2-20s).



2. Soft stopping time regulation: DECEL

Regulate the DECEL of such potentiometer can confirm that clockwise time of descending slope declines from maximum speed to minimum speed (i.e. fall time, setting time can be adjustable within 0.2-10s).



3. Maximum speed limit: MAX SPD

Turn the given potentiometer up to maximum value, and then regulate MAX SPD potentiometer to limit the maximum output revolving speed, clockwise rotate to increase output voltage.

4. Minimum speed limit: MIN SPD

Turn the given potentiometer up to minimum value, and then regulate MIN SPD potentiometer to limit the minimum output revolving speed, clockwise rotate to increase output voltage.

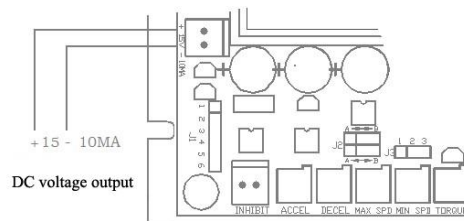
5. Current limit regulation: TORQUE

Regulate such potentiometer can limit the maximum output current of driver board, according to motor's rated current settings selected, maximum output current of driver board shall be 120%-200% of motor's rated current. Clockwise rotate to increase current.

## 6. Torque compensation regulation: IR COMP

Regulate IR COMP potentiometer to operate the motor under different loads and keep it revolving speed constant, clockwise rotate to increase torque.

## XXI. Introduction of special interface



**Note: DC output power is 15V, load current is 10mA**

## XXII. Solutions to common faults

Faults	Causes	Solutions
Fuse is blown	<ol style="list-style-type: none"> <li>1. Fuse is not applicable.</li> <li>2. The output has short circuit.</li> <li>3. Motor does not match with the driver.</li> </ol>	<ol style="list-style-type: none"> <li>1. Select proper fuse according to motor power.</li> <li>2. Check the wiring between driver and motor.</li> <li>3. Select proper driver.</li> </ol>
Motor out-of-operation is	<ol style="list-style-type: none"> <li>1. Command signal is 0 V.</li> <li>2. Disconnection of INHIBIT enable terminal.</li> <li>3. Current output is limited.</li> <li>4. Wiring is incorrect.</li> </ol>	<ol style="list-style-type: none"> <li>1. Regulate speed potentiometer.</li> <li>2. Close enable terminal: INHIBIT</li> <li>3. Confirm whether motor is locked.</li> <li>4. Check the setting of TORQUE potentiometer.</li> <li>4. Check the wiring between driver and motor.</li> </ol> <p>(OUT+ - Terminal: armature which connects with the motor)</p>
Speed of potentiometer is at minimum but motor cannot be stopped.	Setting of J3 contact pin	Setting of J3 contact pin is 2
Motor speed is too fast	Setting of MAX SPD and MIN SPD is too high	Regulate MAX SPD and MIN SPD setting.
Required speed of motor cannot be reached	<ol style="list-style-type: none"> <li>1. MAX SPD setting is too small</li> <li>2. IR COMP setting is too small</li> <li>3. TORQUE setting is too small</li> <li>4. Motor is blocked</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase MAX SPD setting.</li> <li>2. Increase IR COMP setting.</li> <li>3. Increase TORQUE setting</li> <li>4. Check the motor load [if required, regulate the motor's specifications].</li> </ol>
Motor vibrates after acting load	<ol style="list-style-type: none"> <li>1. IR COMP setting is too big</li> <li>2. Lack of current limit</li> </ol>	<ol style="list-style-type: none"> <li>1. Carefully regulate the setting of IR COMP until the motor speed remains steady.</li> <li>2. Regulate the TORQUE setting after confirming that motor matches well with the driver</li> </ol>
Motor runs in reverse direction	Reversal connection of [OUT] + —terminal wiring	Exchange [OUT]+ —terminals
Speed up after acting load of motor	IR COMP setting is too big	Decrease IR COMP setting
Slow down after acting load of motor	IR COMP setting is too small	Increase IR COMP setting

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